Digital Radar For Efficient Surveillance

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Abstract— **The aim of the work is to provide a high efficient surveillance for very costly material like jewelry, gold ornaments and diamonds. In this work an ultra-sonic sensor is collaborated with the digital radar, this sensor senses the range which belongs to it and the digital radar detects the obstacle which falls in that range and sounds alarm as soon as the alarm switched on the driver connected to firing gun will become on and the firing starts on that obstacle or person who come unauthorized . In this way our work can barge the costly equipment effectively.**

Keywords- Ultrasonicsensor; Stepper Motor; Micro Controller; MAX232.

I. INTRODUCTION

Radar full-form is "Radio technology. Radar is being for gathering information about distant objects by transmitting electromagnetic signals to words Detecting and Ranging". Radar is most important applications of microwave the object and analyzing the received echoes. In according to the radar electromagnetic signals have an important property is used to detect the location of the object. RADAR (Radio Detection and Ranging) is a way to detect and study far off targets by transmitting a radio pulse in the direction of the target and observing the reflection of the wave. RADAR is having the advantage of high detection range, high range resolution, and lower algorithmic complexity with moderate hardware cost. Also, it actively works in darkness, rainy and foggy conditions with high accuracy. By using this system we can barge costly equipment and not only that it has its use in defense for detecting missiles and also to protect our nuclear warfare from terrorists also.

II. SYSTEM ARCHITECTURE

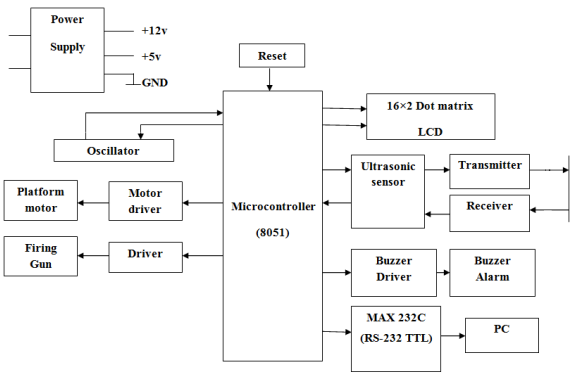


Figure 1. Digital Radar block diagram

A. POWER SUPPLY

The power supply of 230v AC is taken as input to the circuit. Now this supply is applied to step down transformer to change it to 12v AC supply. The 12v AC supply is converted to DC voltage through full wave rectifier. The output of the full wave rectifier is pulsating DC using both half cycles of the applied AC voltage. The DC supply voltage is given to filter capacitor to convert it into pure DC voltage. The output of this filter capacitor is 12V DC supply. The output of the full wave rectifier is also given to the voltage regulator in order to get 5v DC supply.

B. FULL WAVE RECTIFIER

A rectifier converts AC to DC, but the DC output is varying. There are several types of rectifiers; here we use a bridge rectifier. The Bridge rectifier is a circuit, which converts an ac voltage to dc voltage using both half cycles of the input ac voltage. The Bridge Rectifier circuit is shown in the figure. The circuit has four diodes connected to form a bridge. The ac input voltage is applied to the diagonally opposite ends of the bridge. The load resistance is connected between the other two ends of the bridge.

For the positive half cycle of the input ac voltage, diodes D1,D3 conduct, whereas D2 and D4 remain in the OFF state. The conducting diodes will be in series with the load resistance RL and hence the load current flows through RL.

For the Negative half cycle of the input ac voltage, diodes D2 and D4 conduct whereas, D1 and D3 remain OFF. the conducting diodes D2 and D4 will be in series with the load resistance RL and hence the current flows through RL in the same direction as in the previous half cycle. Thus a bi-directional wave is converted into unidirectional.

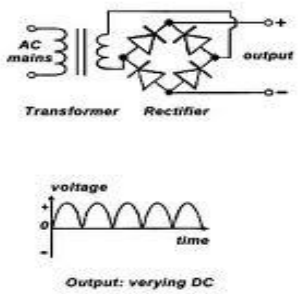


Figure 2. Varying Output DC

The varying DC output is not suitable for lamps, heaters and motors. It is not suitable for electronic circuits unless they include a smoothing capacitor.

C. FILTER CAPACITOR

Capacitors act as filter to remove ripple from power supplies. Once the AC signal from output transformer passed through diodes it would become an uneven DC. A filtering section is used to smooth out this uneven DC signal. Usually, the filter includes one or more capacitors. The capacitors are then placed between the DC line and ground. The value of the capacitors is chosen carefully to give the filter circuit a certain timing constant or TC. This TC measures how fast the circuit responds to changes in the voltage level.

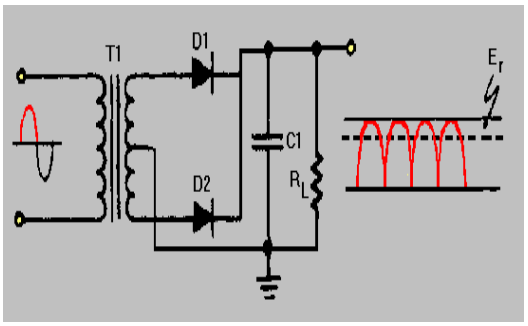


Figure 3. Rectifier with Filter Capacitance Circuit

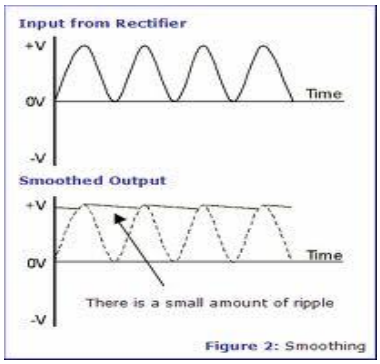


Figure 4. Output Characteristics of Filter Capacitance

If the circuit has just the right timing constant, it can act to smooth the output voltage, and once the voltage leaves the filter stage, most of the variations or "ripple" should be removed. The AC has been converted into a smooth DC.

If the filter capacitors fail either increase in ESR reading or lose some of its capacitance, the AC signal will be allowed to remain with the DC, creating a signal which is noisier than it should it. This unwanted noise signal can cause problems in electronic circuit. If it happens in computer monitor power supply, the bad capacitors can cause power to blink, low power, voltage shutdown, no display, intermittent display problem and many more.

D. VOLTAGE REGULATOR

Voltage regulator consists of a series combination Zener diode and a resistance. The primary function of Zener diode is voltage regulation. Voltage regulation refers to maintaining a constant voltage, even if there is variance in the circuit current flow. For a Zener diode to regulate voltage, the resistance must be placed in series with Zener diode. Zener diode must be connected in reverse bias. The voltage across the Zener diode must exceed its break over rating (a 5.1V).

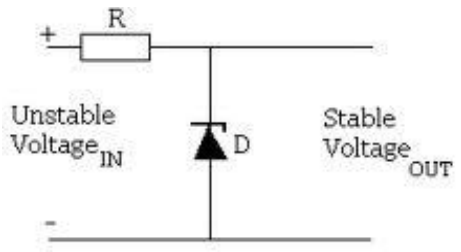


Figure 5. Voltage Regulator

Once the rated Zener diode break over voltage of 5.1V is reached, the voltage remains at the same value. The remaining power across the series resistance is dropped across the series resistance R. The output of the voltage regulator is measured across Zener diode. Once the rated Zener diode break over voltage of 5.1V is reached, the voltage remains at the same value. The remaining voltage from the power source is drops across the series resistor R.

E. MOTORS

1) Linear Motor

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to hardness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion. Let's start by looking at a simple 2-pole DC electric motor (here red represents a magnet or winding with a "North" polarization, while green represents a magnet or winding with a "South" polarization).

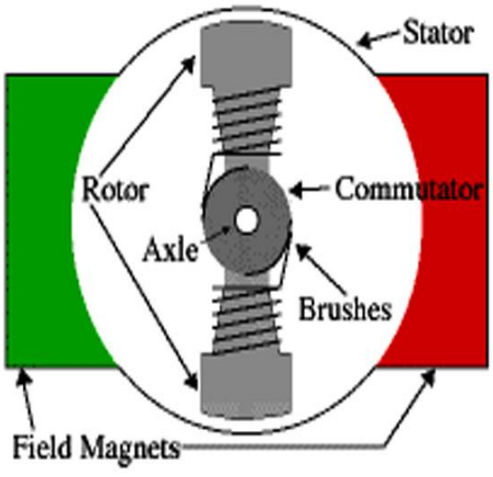
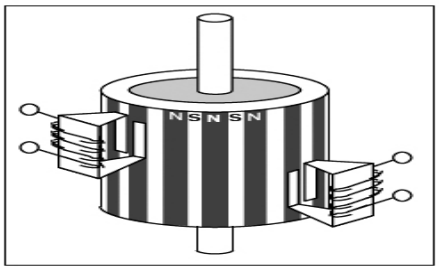


Figure 6. Linear Motor

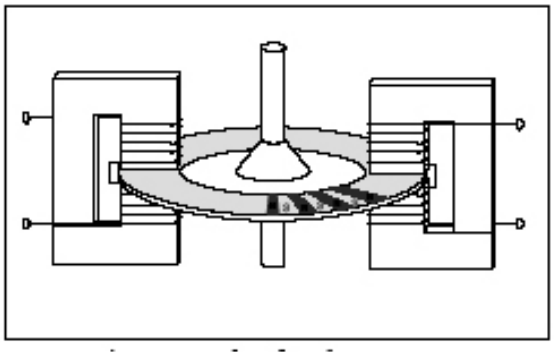
2) Stepper Motor

A stepper motor is an electro-mechanical device which converts electrical pulses into discrete mechanical movements. The shaft or spindle of a stepper motor rotates in discrete step increments when electrical command pulses are applied to it in the proper sequence. The motors rotation has several direct relationships to these applied input pulses. The sequence of the applied pulses is directly related to the direction of motor shafts rotation. The speed of the motor shafts rotation is directly

related to the frequency of the input pulses and the length of rotation is directly related to the number of input pulses applied.



(a)



(b)

Figure 7. (a) Principle of Stepper Motor (b) Principle of a disc-magnetic motor

When a phase winding of a stepper motor is energized with current a magnetic flux is developed in the stator. The direction of this flux is determined by the "Right Hand Rule" which states: "If the coil is grasped in the right hand with the fingers pointing in the direction of the current in the winding (the thumb is extended at a 900 angle to the fingers), then the thumb will point in the direction of the magnetic field." Figure shows the magnetic flux path developed when phase B is energized with winding current in the direction shown. The rotor then aligns itself so that the flux opposition is minimized. In this case the motor would rotate clockwise so that its south pole aligns with the north pole of the stator B at position 2 and its north pole aligns with the south pole of stator B at position 6. To get the motor to rotate we can now see that we must provide a sequence of energizing the stator windings in such a fashion that provides a rotating magnetic flux field which the rotor follows due to magnetic attraction.

F. Micro Controller (AT89C52)

The AT89C52 is 80C51 microcontrollers with 128kB Flash and 1024 bytes of data RAM.A key feature of the AT89C52 is its X2 mode option. The design engineer can choose to run the application with the conventional 80C51 clock rate (12 clocks per machine cycle) or select the X2 mode (6 clocks per machine cycle) to achieve twice the throughput at the same clock frequency. Another way to benefit from this feature is to keep the same performance by reducing the clock frequency by half, thus dramatically reducing the EMI.

The Flash program memory supports both parallel programming and in serial In-System Programming (ISP). Parallel programming mode offers gang-programming at high speed, reducing programming costs and time to market. ISP allows a device to be reprogrammed in the end product under software control. The capability to field/update the application firmware makes a wide range of applications possible. The AT89C52 is also In-Application Programmable (IAP), allowing the Flash program memory to be reconfigured even while the application is running.

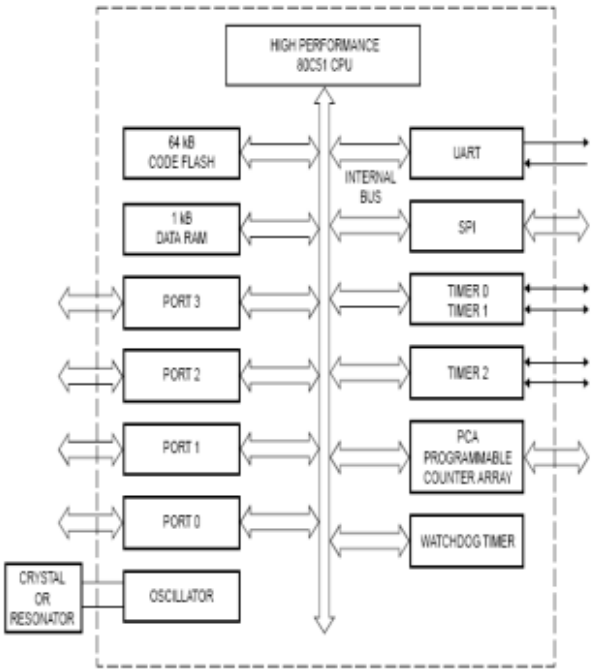


Figure 8. AT89C52 MICRO CONTROLLER

G. FUNCTIONAL DESCRIPTION

1) Power-On reset code execution

Following reset, the AT89C52 will either enter the Soft ICE mode (if previously enabled via ISP command) or attempt to auto baud to the ISP boot loader. If this auto baud is not successful within about 400 ms, the device will begin execution of the user code.

H. IN-SYSTEM PROGRAMMING (ISP)

The Atmel Microcontroller ISP Software is the primary means for performing in-system programming (ISP) for the Atmel devices. It provides an intuitive interface for in-system programming that can be run from your personal computer. The Atmel ISP Software has a comprehensive set of features that allows you to view, program, and erase data from an Atmel ISP device. The Atmel Microcontroller ISP Software also allows you to load hex files containing the code you want to add to the device. Using the software, you can manipulate this code, verify it against the existing code on the device, and program the code onto the device. Additionally, using the software, you can read any existing code from the device and make minor changes to the code. You can then update the device with your changes or save them to a hex file for use with other devices. The software also allows you to protect third parties from accidentally reprogramming the device and even allows you to lock the device so that the code cannot be read from it. Atmel's microcontroller ISP Software contains a variety of tools customized for Atmel ISP devices. Input/output (I/O) ports 32 of the pins are arranged as four 8-bit I/O ports P0–P3. Twenty-four of these pins are dual purpose with each capable of operating as a control line or part of the data/address bus in addition to the I/O functions. Details are as follows:

Port 0: This is a dual-purpose port occupying pins 32 to 39 of the device. The port is an open-drain bidirectional I/O port with Schmitt trigger inputs. Pins that have 1s written to them float and can be used as high-impedance inputs. The port may be used with external memory to provide a multiplexed address and data bus. In this application internal pull-ups are used when emitting 1s. The port also outputs the code bytes during EPROM programming. External pull-ups are necessary during program verification.

Port 1: This is a dedicated I/O port occupying pins 1 to 8 of the device. The pins are connected via internal pull-ups and Schmitt trigger input. Pins that have 1s written to them are pulled high by the internal pull-ups and can be used as inputs; as inputs, pins that are externally pulled low will source current via the internal pull-ups. The port also receives the low-order address byte during program memory verification. Pins P1.0 and P1.1 could also function as external inputs for the third timer/counter i.e.:

(P1.0) T2 Timer/counter 2 external count input/clockout

(P1.1) T2EX Timer/counter 2 reload/capture/direction control

Port 2: This is a dual-purpose port occupying pins 21 to 28 of the device. The specification is similar to that of port 1. The port may be used to provide the high-order byte of the address bus for external program memory or external data memory that uses 16-bit addresses. When accessing external data memory that uses 8-bit addresses, the port emits the contents of the P2 register. Some port 2 pins receive the high-order address bits during EPROM programming.

Port 3: This is a dual-purpose port occupying pins 10 to 17 of the device. The specification is similar to that of port 1. These pins, in addition to the I/O role, serve the special features of the 80C51 family B.

I. Ultrasonic Sensor

Ultrasonic sensors (also known as transceivers when they both send and receive) work on a principle similar to radar or sonar which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object.

Figure 9. Ultrasonic Sensor Diagram

This technology can be used for measuring: wind speed and direction (anemometer), fullness of a tank and speed through air or water. For measuring speed or direction a device uses multiple detectors and calculates the speed from the relative distances to particulates in the air or water. To measure the amount of liquid in a tank, the sensor measures the distance to the surface of the fluid. Further applications include: humidifiers, sonar, medical ultrasonic graphic, burglar alarms and non-destructive testing. Ultrasonic sensor is a sensor that works on the principle of reflection of sound waves and is used to detect the presence of a particular object in front of it; it works on the area above the frequency of sound waves from 40 KHz to 400 KHz.

J. Buzzer

A buzzer or beeper is a signaling device, usually electronic, typically used in automobiles, household appliances such as a microwave oven, or game shows. It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a preset time has lapsed, and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound. Initially this device was based on an electromechanical system which was identical to an electric bell without the metal gong (which makes the ringing noise). Often these units were anchored to a wall or ceiling and used the ceiling or wall as a sounding board. Another implementation with some AC-connected devices was to implement a circuit to make the AC current into a noise loud enough to drive a loudspeaker and hook this circuit up to a cheap 8-ohm speaker. Now-a-days, it is more popular to use a ceramic-based piezo-electric sounder like a Son alert which makes a high-pitched tone. Usually these were hooked up to driver" circuits which varied the pitch of the sound or pulsed the sound on and off.

K. Buzzer Driver

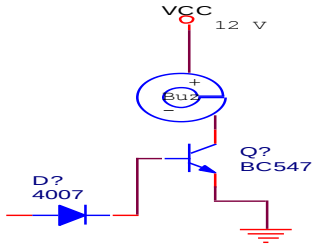


Figure 10. Buzzer Diagram

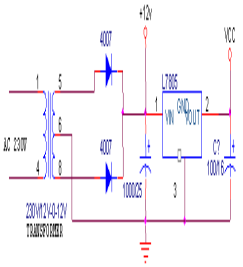
The circuit is designed to control the buzzer. The buzzer ON and OFF is controlled by the pair of switching transistors (BC 547). The buzzer is connected in the Q2 transistor collector terminal. When high pulse signal is given to base of the Q1 transistors, the transistor is conducting and close the collector and emitter terminal so zero signals is given to base of the Q2 transistor. Hence Q2 transistor and buzzer is turned OFF state. When low pulse is given to base of transistor Q1, the transistor is turned OFF. Now 12V is given to base of Q2 transistor so the transistor is conducting and buzzer is energized and produces the sound signal.

III. SCHEMATIC DIAGRAM

A) Circuit working

After the initial power-on of the kit, the program counter of the micro controller scans for the EA pin and goes for the internal memory starting location, 0000H and starts executing the program. It initializes the LCD display and displays the name of the circuit. After the initialization is over, the micro controller scans the UART port for serial data. The ultrasonic module connected to the UART port of the micro controller has 3-pins (Vcc, Gnd and Data). The module contains a transmitter

and receiver. The transmitter transmits an ultrasonic wave and waits for the receiving it. When the module receives the code, it calculates the time taken for the reflection. Using the calculation, the time is converted into distance and is given as output in the form of TTL serial out. The TTL serial data is connected to the Rxd pin of Micro controller and is taken for comparison. The received data is the distance in CM`s. So the micro controller executes a comparison program to find out the range of the distance of obstacle.



POWER SUPPLY

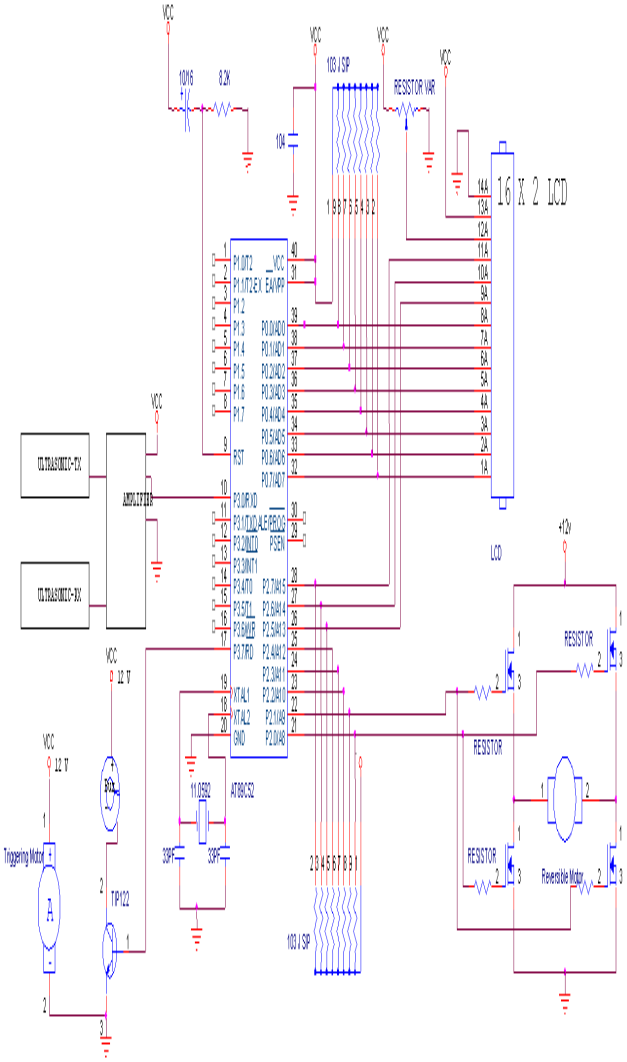


Figure 11. Schematic diagram

Figure 12. Kit Diagram

IV. CONCLUSION

The ability to remotely monitor and/or control power at the rack level can provide a huge return on investment by providing savings in both man hours and downtime. Remote monitoring capabilities eliminate the need for manual power audits as well as provide immediate alerts to potential problems. Remote control allows for quick response and recovery of stalled hardware either down the hall or across the country. This ability can save not only travel costs but minimize costly downtime.

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